

UNCLASSIFIED

AD NUMBER	
AD037811	
CLASSIFICATION CHANGES	
TO:	unclassified
FROM:	confidential
LIMITATION CHANGES	
TO: Approved for public release; distribution is unlimited.	
FROM: Distribution authorized to DoD only; Administrative/Operational Use; APR 1953. Other requests shall be referred to Navy Bureau of Ships, Navy Yard, Washington, DC.	
AUTHORITY	
30 jun 1965, DoDD 5200.10; cfsti per navy, 1 apr 1968	

THIS PAGE IS UNCLASSIFIED

Armed Services Technical Information Agency

Because of our limited supply, you are requested to return this copy WHEN IT HAS SERVED YOUR PURPOSE so that it may be made available to other requesters. Your cooperation will be appreciated.

AD 378111

NOTICE: WHEN GOVERNMENT OR OTHER DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE U. S. GOVERNMENT THEREBY INCURS NO RESPONSIBILITY, NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

**Reproduced by
DOCUMENT SERVICE CENTER
KNOTT BUILDING, DAYTON, 2, OHIO**

CONFIDENTIAL

**NOTICE: THIS DOCUMENT CONTAINS INFORMATION AFFECTING THE
NATIONAL DEFENSE OF THE UNITED STATES WITHIN THE MEANING
OF THE ESPIONAGE LAWS, TITLE 18, U.S.C., SECTIONS 793 and 794.
THE TRANSMISSION OR THE REVELATION OF ITS CONTENTS IN
ANY MANNER TO AN UNAUTHORIZED PERSON IS PROHIBITED BY LAW.**

CONFIDENTIAL

SECURITY INFORMATION

VARIAN ASSOCIATES
ENGINEERING REPORT

COPY NO. 21

AD No. 37811
ASTIA FILE COPY

FURTHER DISSEMINATION IS AUTHORIZED ONLY TO
MILITARY AGENCIES.

PROGRESS REPORT

DESIGN AND DEVELOPMENT OF KLYSTRON

OSCILLATOR V-39 AND V-40

For Period: 1 April to 30 April 1953

Prepared for

Bureau of Ships

Navy Department


on


BUSHIPS CONTRACT N0bsr-52105
Index No. NE 110244

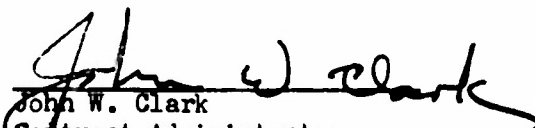
Prepared by:

Stuart Hernies

Approved by:


H. Myrl Stearns
Vice-Pres. and Gen. Manager


Sigurd F. Varian
Vice-Pres. for Engineering


John W. Clark
Contract Administrator

8110730-54

JUNE 1953

NOTICE:

This document contains information affecting the national defense of the United States within the meaning of the Espionage Laws, Title 18 U. S. C., Sections 793, 794, 795. Its transmission or the revelation of its contents in any manner to an unauthorized person is prohibited by law.

Page 1 of 10

CONFIDENTIAL

SECURITY INFORMATION

5444 491

CONFIDENTIAL

SECURITY INFORMATION

PURPOSE

The purpose of the program engaged under BuShips Contract No. NObsr-52105 is to design and develop two wide-range klystron oscillators, V-39 and V-40, which will comply with the specifications outlined in this contract.

The two oscillators will cover the frequency band from 10 to 21 kmc. One tube will tune over the lower half of the band from 10 to 15.5 kmc, and the other will cover the band from 15 to 21 kmc. Preliminary design tubes of each type, complete with electrical test and characteristic data, will be furnished. In addition, five tubes embodying the final design of each type will be supplied, along with electrical characteristics and test data, final proposed specifications, and manufacturing drawings.

Page 2 of 10

CONFIDENTIAL

SECURITY INFORMATION

34AA

491

CONFIDENTIAL
SECURITY INFORMATION

PROGRESS

Five V-39 tubes and five V-40 tubes were completed this month. The V-39 tubes had single-piece reflectors, and no bias was required on the cathode focus. All but one of the V-40 tubes had single-piece reflectors and cathodes which required no focus voltage; one V-40 (tube No. 52) required negative cathode focus voltage. Data were taken of these 10 tubes, with 750 volts of beam voltage applied and two reflector modes used to cover the tuning range. Table 1 gives the optimum power output over the tuning range of each tube plus any applicable comments concerning tube performance or status.

TABLE 1

<u>Tube No.</u>	<u>Power Output (mw)</u>	<u>Remarks</u>
(a) V-39 Tubes		
13	50	830 v beam voltage.
14	75	
15	100	Tube on loan to Hewlett-Packard Company and Bureau of Ships.
16	—	Tube lost in manufacture.
17	90	Tube went down to air.
(b) V-40 Tubes		
52	125	-40 v cathode focus voltage.
53	—	Tube required use of 3 reflector modes to cover band. Hole was found in reflector grid.

CONFIDENTIAL

SECURITY INFORMATION

TABLE 1 (CONT.)

Tube No.	Power Output (mw)	Remarks
54	--	Tube required use of 3 reflector modes to cover band.
55	70	
56	--	Tube lost in manufacture.
57	--	Tube lost in manufacture.
58	200	

V-40 tube No. 52 had a small output iris and was highly undercoupled. The other V-40 tubes had a larger output iris, and the power into a matched load was approximately the same as the power into an optimum load at 21 kmc.

Figures 1, 2, 3, and 4 show the power output as a function of frequency for tubes No. 15, 17, 55, and 58, respectively.

Work was continued on the mode suppression problem, particularly as applied to the V-39. The operation of the mode suppressors used with the V-39 requires that the waveguide forming the mode suppressor either have a cut-off frequency higher than the frequency of the λ mode or that the plunger cover the coupling iris when the cut-off frequency is below the frequency of the λ mode. Two of these mode suppressors are required on average or weak tubes, but a third suppressor is required on the best tubes. Mode interference between the $\lambda/2$ and λ cavity modes still exists when the frequency of the λ mode is about 14 kmc.

CONFIDENTIAL

SECURITY INFORMATION

CONFIDENTIAL

SECURITY INFORMATION

Several shorting plungers were made for use in the external cavity of the V-40. An interesting feature of V-40 tubes No. 55 and 58 is that all the undesired cavity modes can probably be suppressed since the $\lambda/2$ cavity mode oscillates at approximately 14.7 kmc when the λ mode is at 21 kmc. A simple steel screw inserted in the cavity near the tube suppresses the $\lambda/2$ mode at the critical interfering point.

One V-39 (tube No. 15), complete with mode suppressors, and one V-40 (tube No. 51), built in March without mode suppressors, were shipped to the Bureau of Ships on loan for evaluation tests on 15 April 1953.

Four V-39 tubes and six V-40 tubes are under construction at the present time.

Page 5 of 10

CONFIDENTIAL

SECURITY INFORMATION

CONFIDENTIAL

SECURITY INFORMATION

PROGRAM FOR NEXT INTERVAL

Construction and testing of additional V-39 and V-40 tubes will continue during the next interval. Work on the mode suppression and matching problems of these tubes will also be continued.

Estimated expenditures during April 1953: \$11,000.00

Estimated man-hours during April 1953: 1400

CONFIDENTIAL

SECURITY INFORMATION

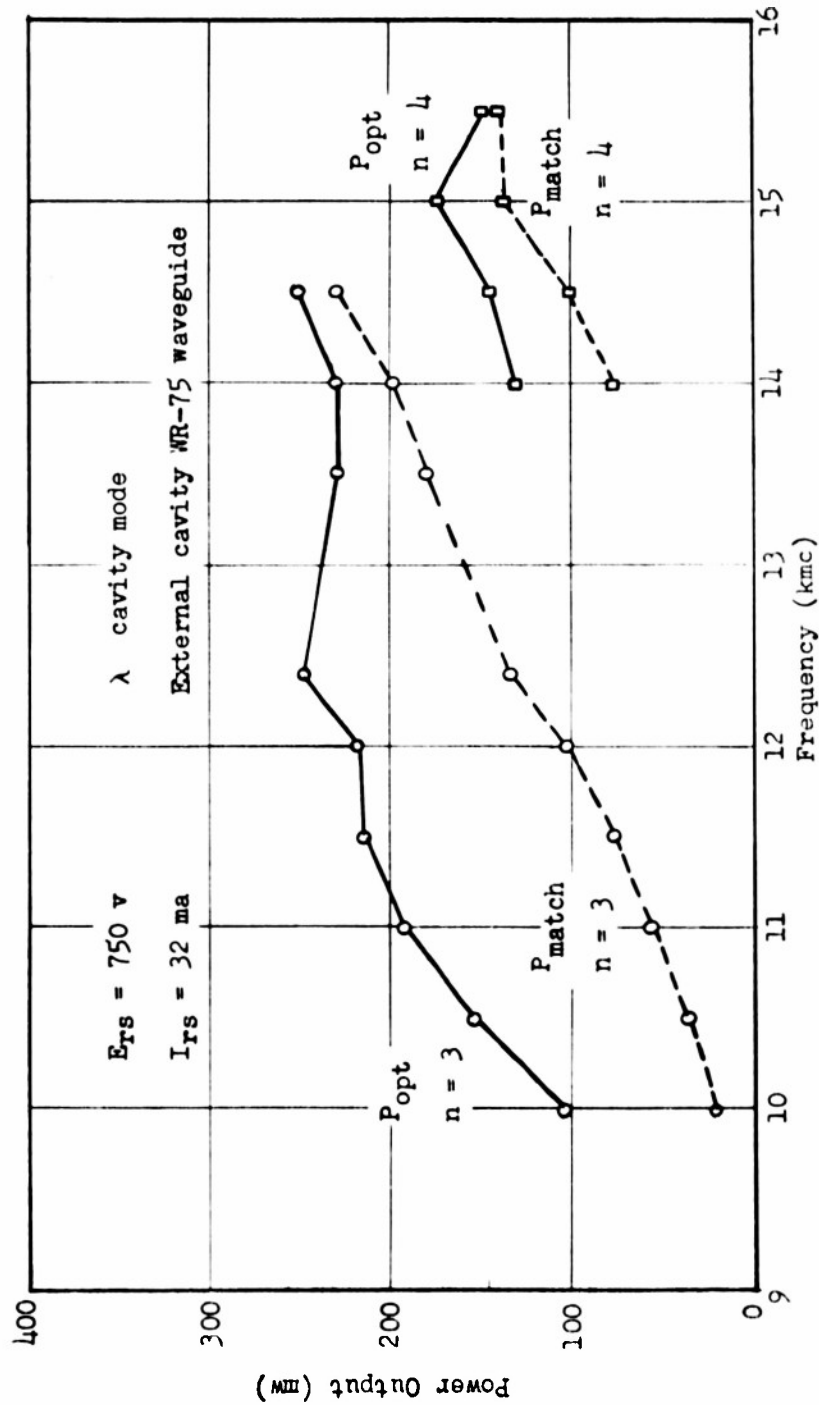


FIGURE 1
POWER OUTPUT vs. FREQUENCY FOR V-39 TUBE NO. 15

CONFIDENTIAL
SECURITY INFORMATION

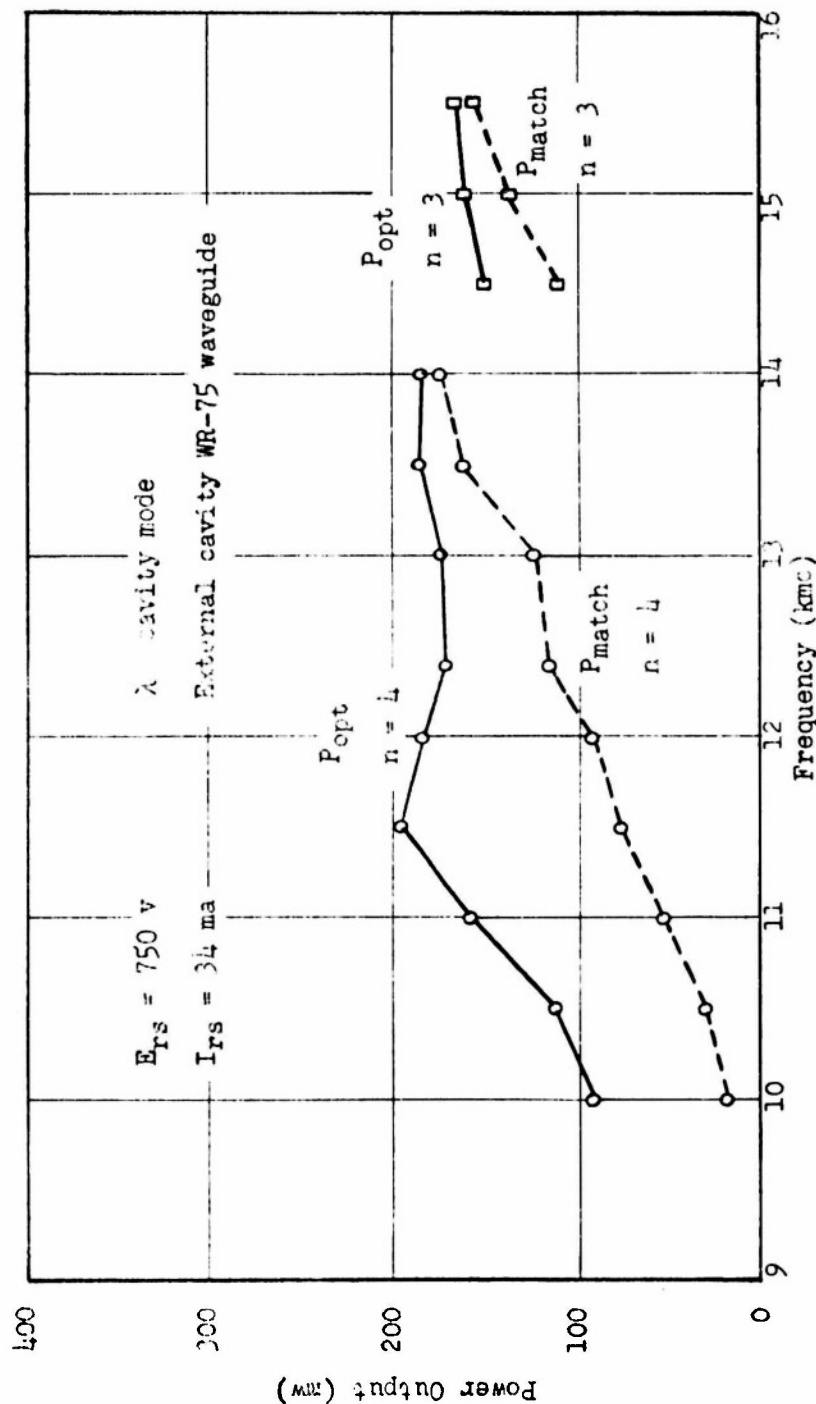


FIGURE 2

POWER OUTPUT vs. FREQUENCY FOR V-39 TUBE NO. 17

CONFIDENTIAL
SECURITY INFORMATION

CONFIDENTIAL

SECURITY INFORMATION

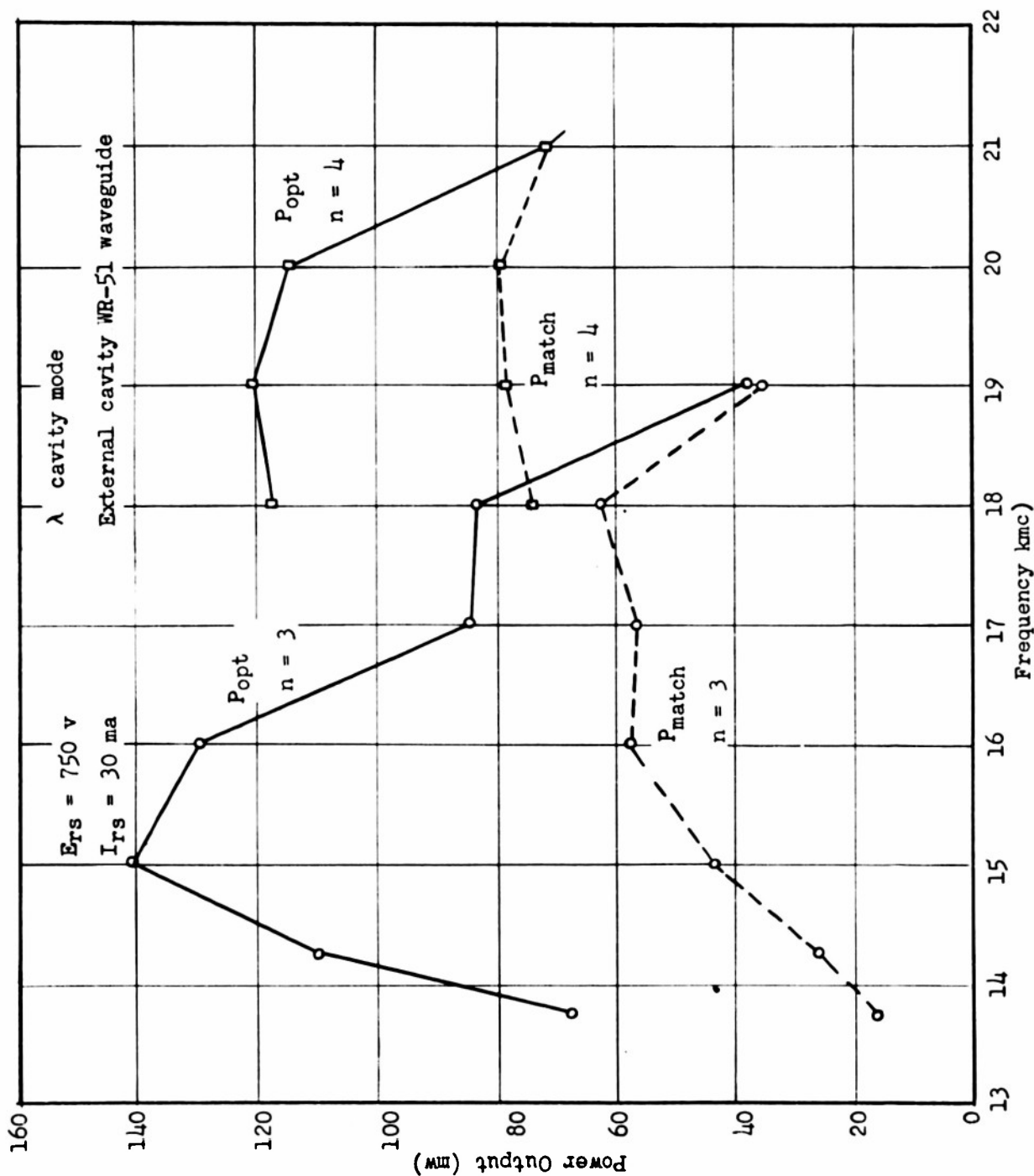


FIGURE 3

POWER OUTPUT vs. FREQUENCY FOR V-40 TUBE NO. 55

CONFIDENTIAL

SECURITY INFORMATION

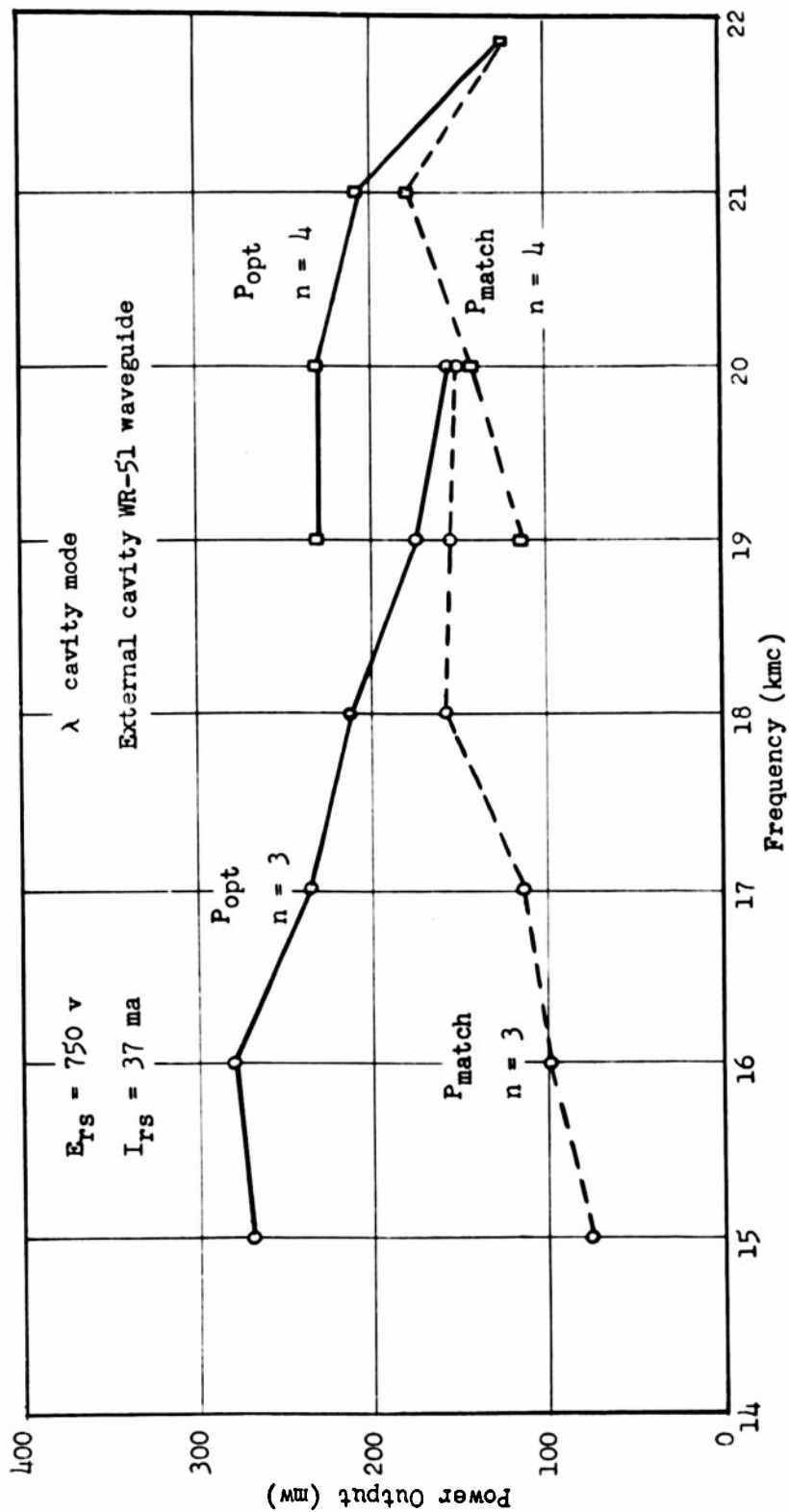


FIGURE 4
POWER OUTPUT vs. FREQUENCY FOR V-40 TUBE NO. 58

Armed Services Technical Information Agency

Because of our limited supply, you are requested to return this copy **WHEN IT HAS SERVED YOUR PURPOSE** so that it may be made available to other requesters. Your cooperation will be appreciated.

AD 378111

NOTICE: WHEN GOVERNMENT OR OTHER DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE U. S. GOVERNMENT THEREBY INCURS NO RESPONSIBILITY, NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

**Reproduced by
DOCUMENT SERVICE CENTER
KNOTT BUILDING DAYTON 2, OHIO**

CONFIDENTIAL